

**INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS MANAGEMENT**

**FIELD DETERMINATION OF DEFLECTION USING
LIGHT WEIGHT DEFLECTOMETER
ITM No. 508-12T**

1.0 SCOPE

- 1.1** This test method covers the determination of deflections with a Light Weight Deflectometer (LWD).
- 1.2** The LWD may be used for granular soils, coarse aggregates, chemical modified soils, or as directed by the Department. Granular soils with aggregates retained on the 3/4 in. sieve, coarse aggregate sizes No. 43, 53, and 73, and structural backfill sizes 2 in. and 1 1/2 in. shall be tested with the LWD.
- 1.3** The LWD test relates deflection with the Dynamic Elastic Modulus and is defined as the maximum axial stress of a material in sinusoidal loading divided by the maximum axial strain during that loading.
- 1.4** The values stated in SI metric units are to be regarded as standard, as appropriate for a specification with which this ITM is used.
- 1.5** This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 ASTM Standards.

E 2583 Measuring Deflections with a Light Weight Deflectometer (LWD)

3.0 TERMINOLOGY. . Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101 and the following:

- 3.1 Granular Soil.** Soil that is non-cohesive with 35 % or less material passing the No. 200 sieve.
- 3.2 Coarse Aggregate.** Aggregate that has a minimum of 20 % retained material on the No. 4 sieve.

3.3 Chemical Modified Soil. Soil that has been modified with portland cement, fly ash, lime, cement by-product, or a combination of these materials

4.0 SIGNIFICANCE AND USE. This ITM shall be used to determine the surface deflection resulting from an application of an impulse load using the LWD. The resulting deflections are used to determine the stiffness of granular materials in embankments and other applications.

5.0 APPARATUS.

5.1 Force-Generating Device (Appendix A), 10 kg \pm 0.1kg falling weight with a guide system, lock pin and spring assembly. The mass of the guide rod is 5 kg \pm 0.25 kg and the maximum impact force is 7.07 kN. The fixed drop height shall be in accordance with the manufacturer recommendation.

5.2 Loading Plate, made of steel, having dimensions of 300 mm in diameter and 20 mm in thickness. The plate shall have two handles and weigh 15 kg \pm 0.25 kg.

5.3 Deflection Sensor, capable of measuring the maximum vertical movement with an accelerometer. The accelerometer is required to be attached to the center of the plate.

5.4 Data Processing and Storage System, capable of displaying and recording the loading data, deflection data, and the test location for each test

5.5 Miscellaneous equipment such as a spade, broom, trowel, and cotton gloves

6.0 TEST AREA PREPARATION. The test area shall be leveled so that the entire undersurface of the load plate is in contact with the material being tested. Loose and protruding material shall be removed. If required, any unevenness shall be filled with fine sand. The test shall not be conducted if the temperature is below freezing. The test area shall be at least 1.5 times larger than the loading plate.

7.0 PROCEDURE.

7.1 Rotate the loading plate approximately 45° back and forth to seat the plate. The plate should not move laterally with successive drops of the falling weight.

7.2 Place the force generating device onto the loading plate. Hold the guide rod perpendicular to the loading plate.

7.3 Conduct three seating drops by raising the falling weight to the release mechanism, allowing the hammer to fall freely, and catching the falling weight after the weight rebounds from striking the plate.

- 7.4** Following the three seating drops, conduct three drops of the falling weight and record the data for each drop. A test is considered invalid if the operator does not catch the falling weight after the weight rebounds from the load plate or the load plate moves laterally. A new test area is required at least 2 ft away from the original area of testing when the test is invalid. If the change in deflection is 10 % or greater for any two consecutive drops, the material shall require additional compaction or aeration and steps 7.1, 7.2, and 7.3 shall be repeated.
- 7.5** Record the smartcard number and the test drop deflection measurements on the data collection form.
- 8.0 CALCULATIONS.** Calculate the average deflection of the three drops after the seating drops.
- 9.0 REPORT.** Report the average deflection in mm.

